Desorption Rate in RHIC Warm Sections

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September 16, 2004

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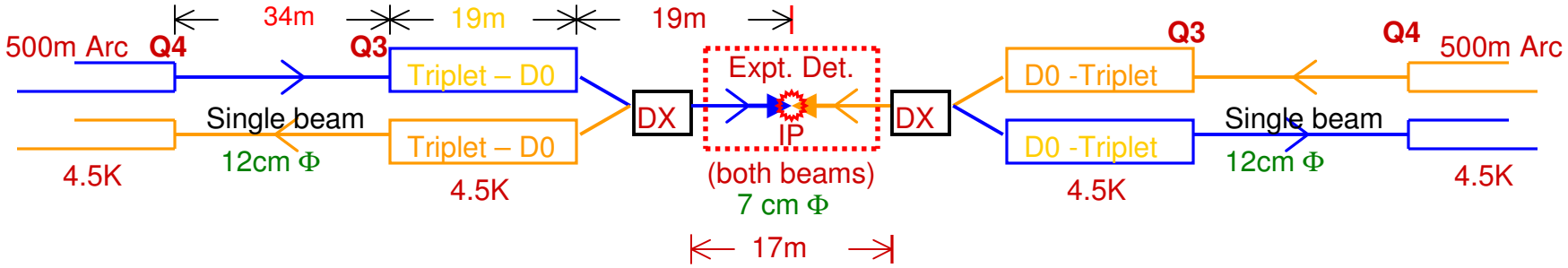
Desorption Rate from Single Turn Kick

- Use one single corrector dipole to bend beam onto beam pipe. With various corrector strength, the whole beam pipe in one warm section was scanned.
- Repeat with various warm sections.
- The idea is to generate beam loss locally around these vacuum gauges and correlate the pressure rises with the beam loss.

Layout of Warm Vacuum Sections – Insertions + IR



Beam pipes used in the study:

Bo2 Partially baked, one NEG pipe (Q3->Q4)

Bi12 Partially baked, no NEG pipe (Q3->Q4)

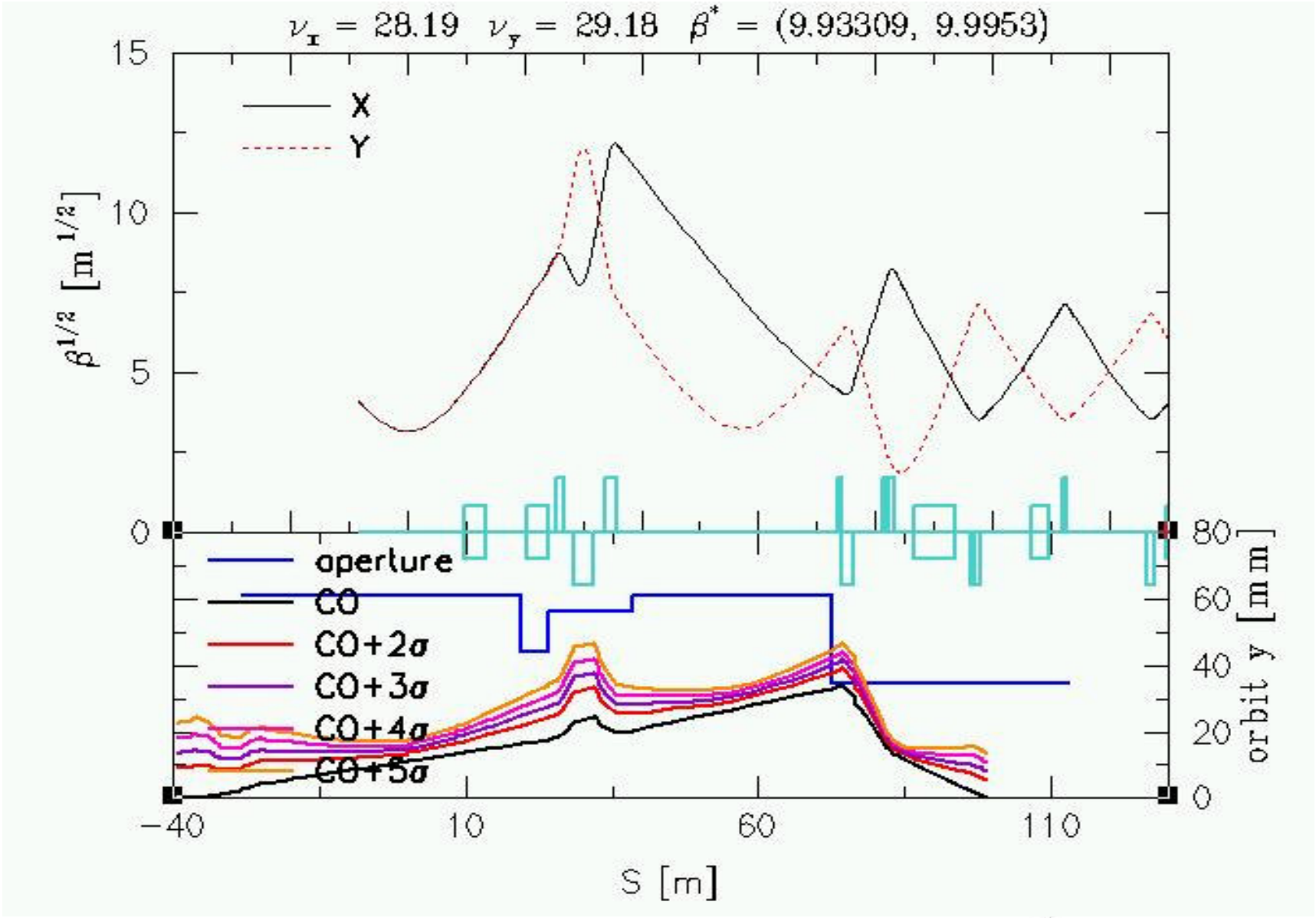
Bo11 Baked, no NEG pipe (Q4->Q3)

Bi9 Baked, two NEG pipes (Q4->Q3)

Yo12 Partially baked, no NEG pipe (Q4->Q3)

Yi10 Baked, four NEG pipes (Q4->Q3)

Bump Used in the Study



Estimation of Desorption Rate

$$\eta = G \times \Delta P \times \Delta t \times S_{eff}/(2N)$$

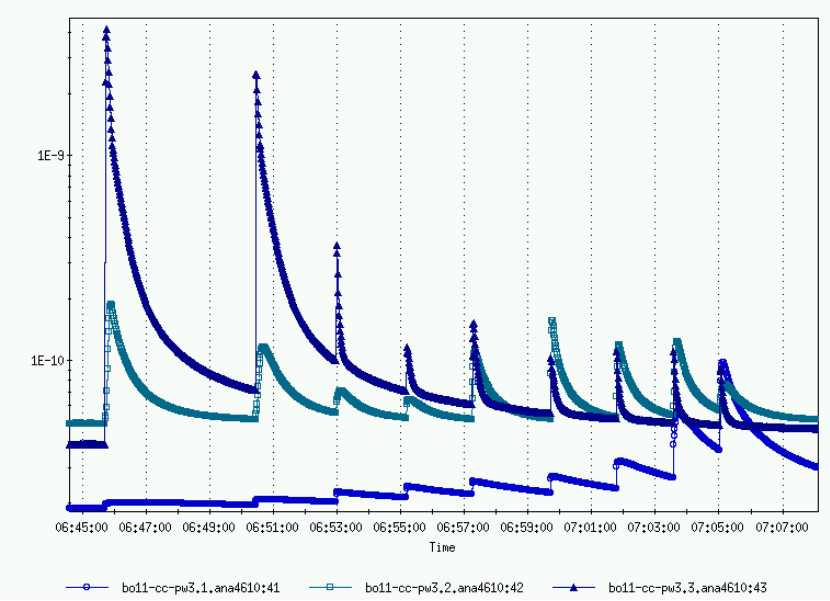
G: 3.54×10^{19}[Torr*l/molecules] at 0C

S_{eff}: Pumping speed [l/s]

ΔP: Pressure rise [Torr]

Δt: Time of pumping down

N: number of impacting ions



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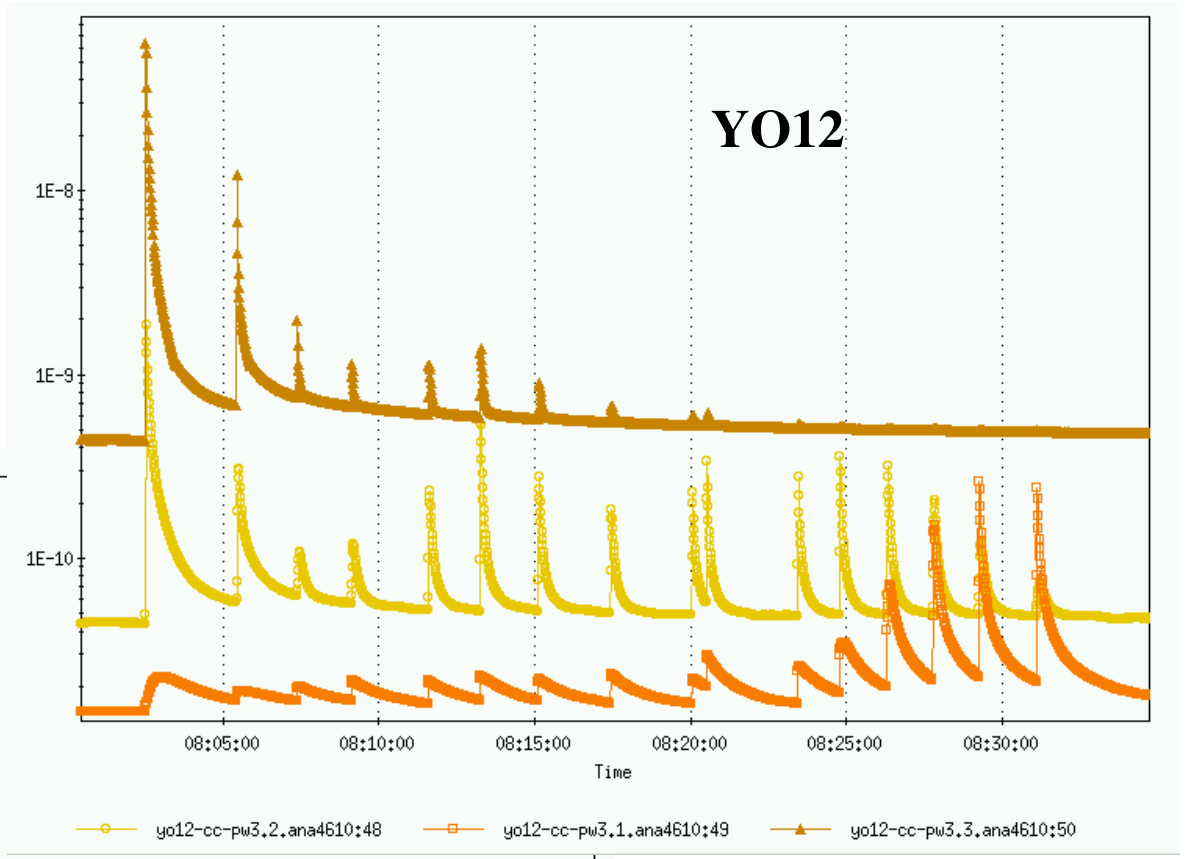

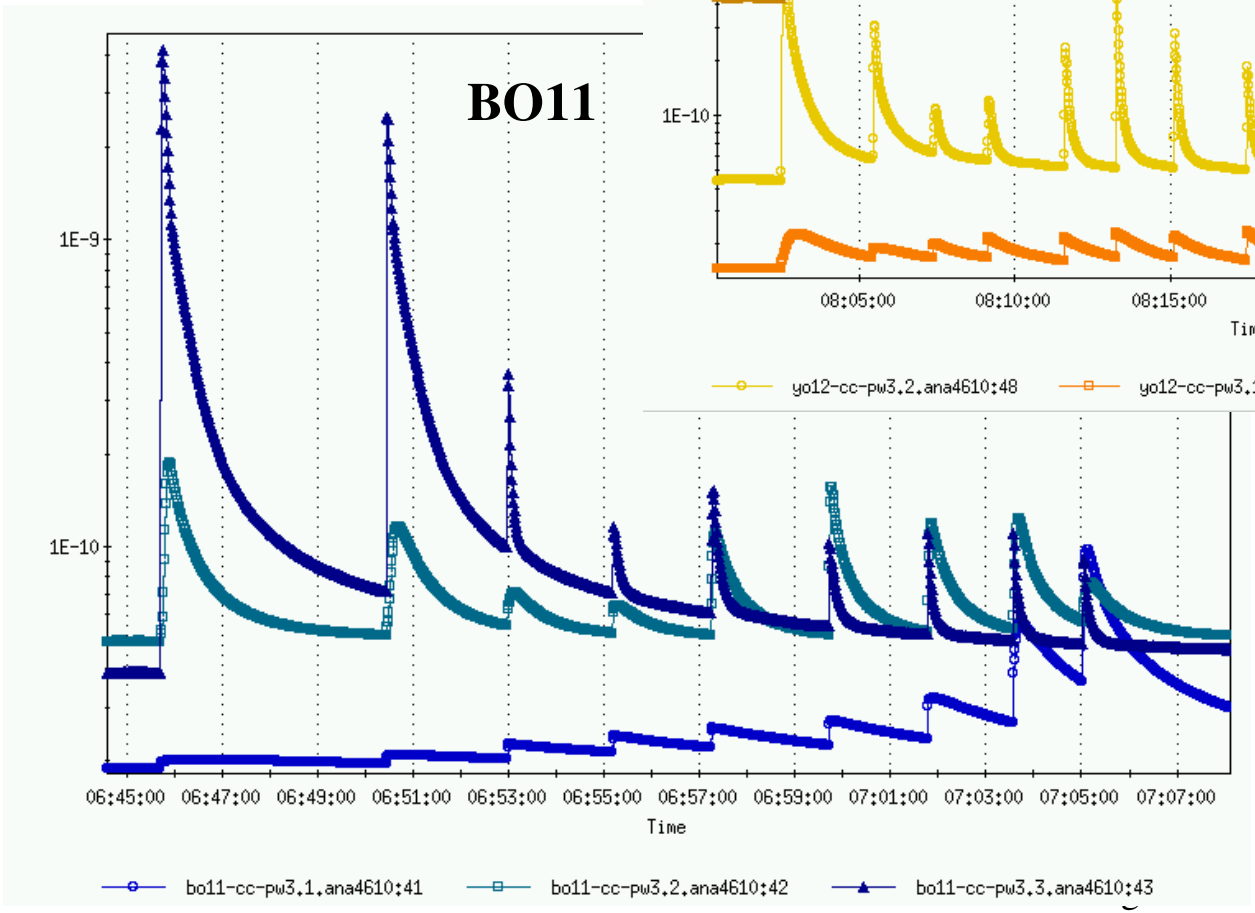

Similar patterns in the two regions.

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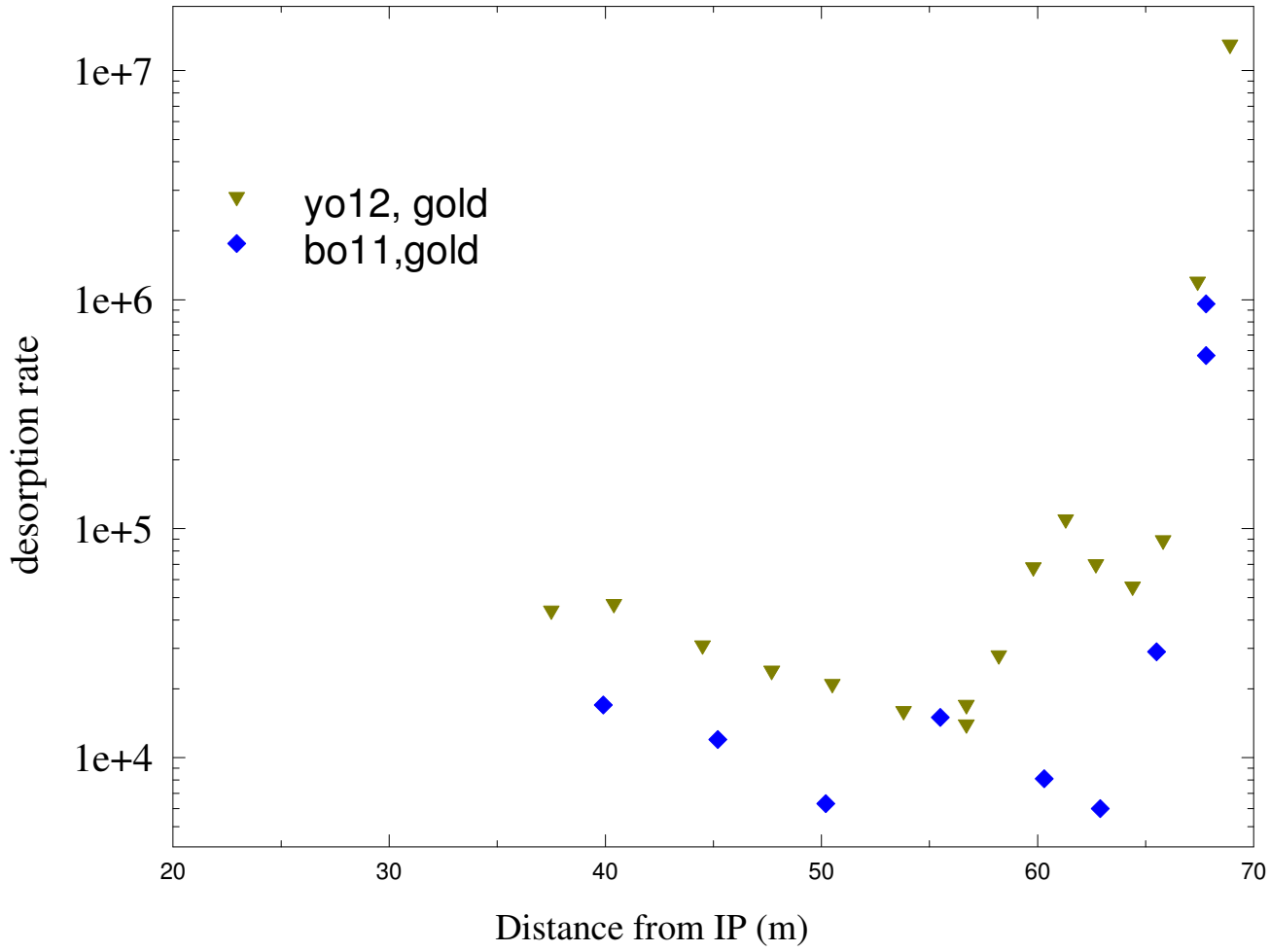
Desorption Rate at YO12 and BO11



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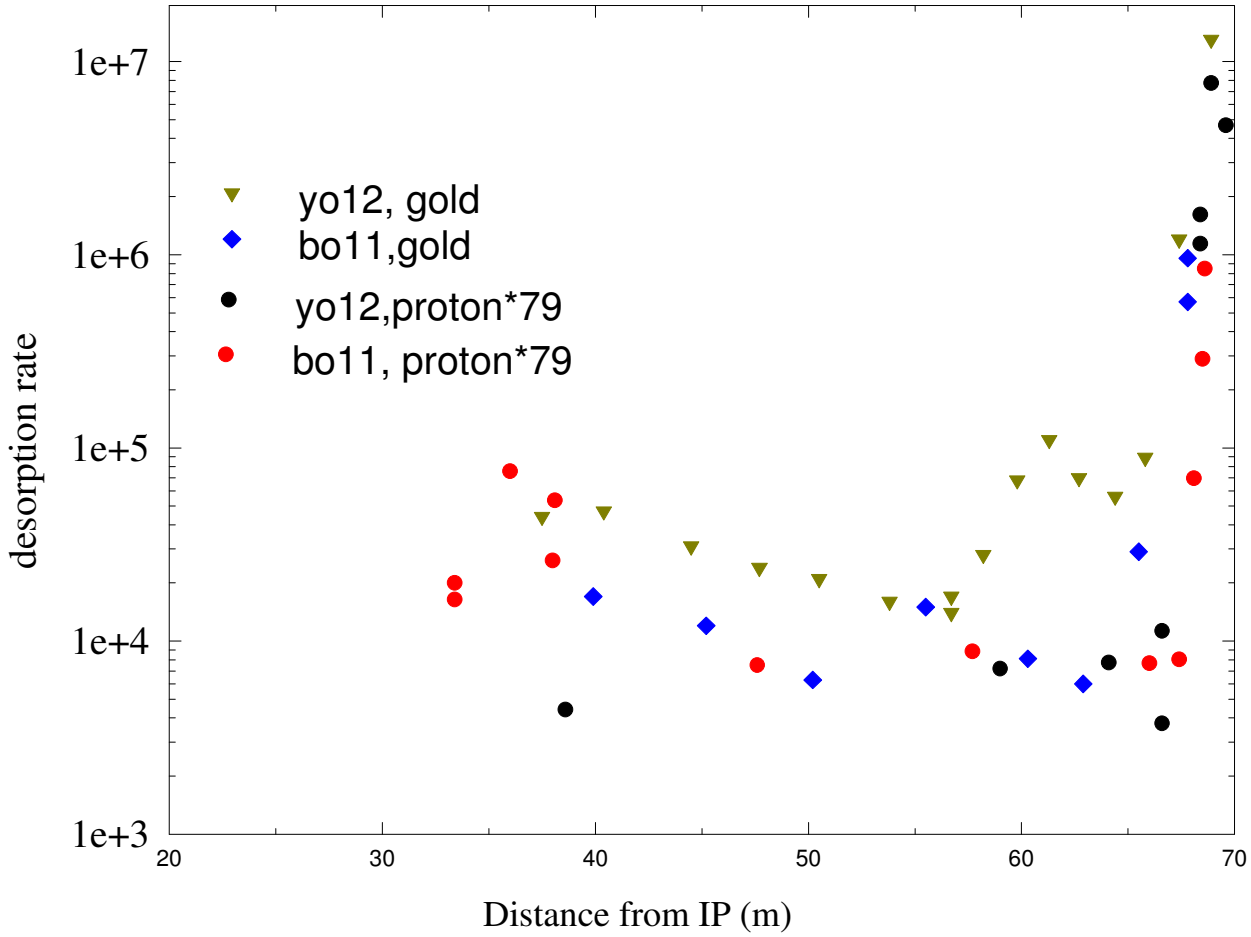
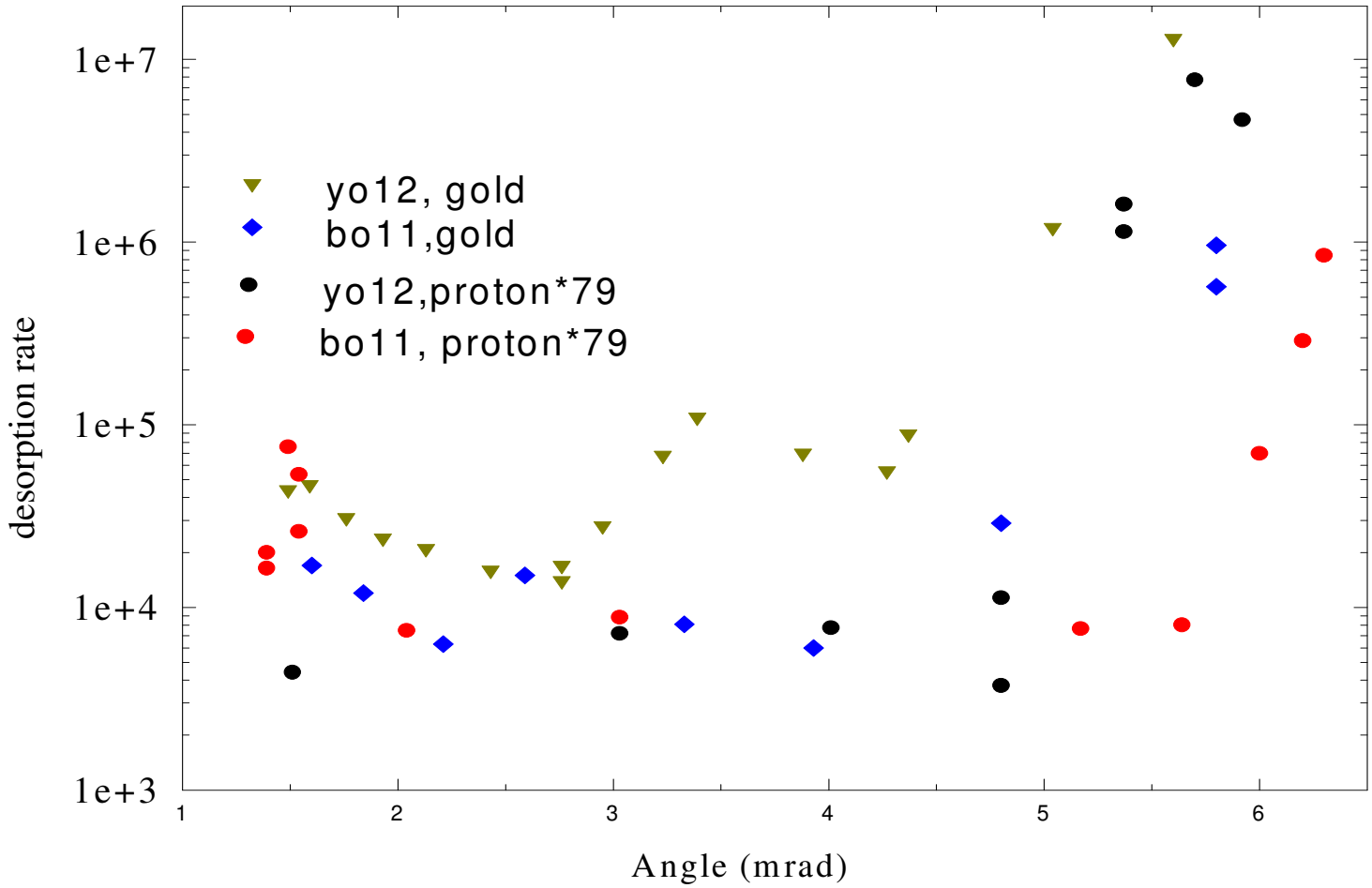
Desorption Rate for Both Au and Protons



The proton desorption rate *~100 (79 or 197?) are similar to gold case.

Desorption Rate vs. Angles at IP12



The desorption rate does not follow 1/sin(α) at all.

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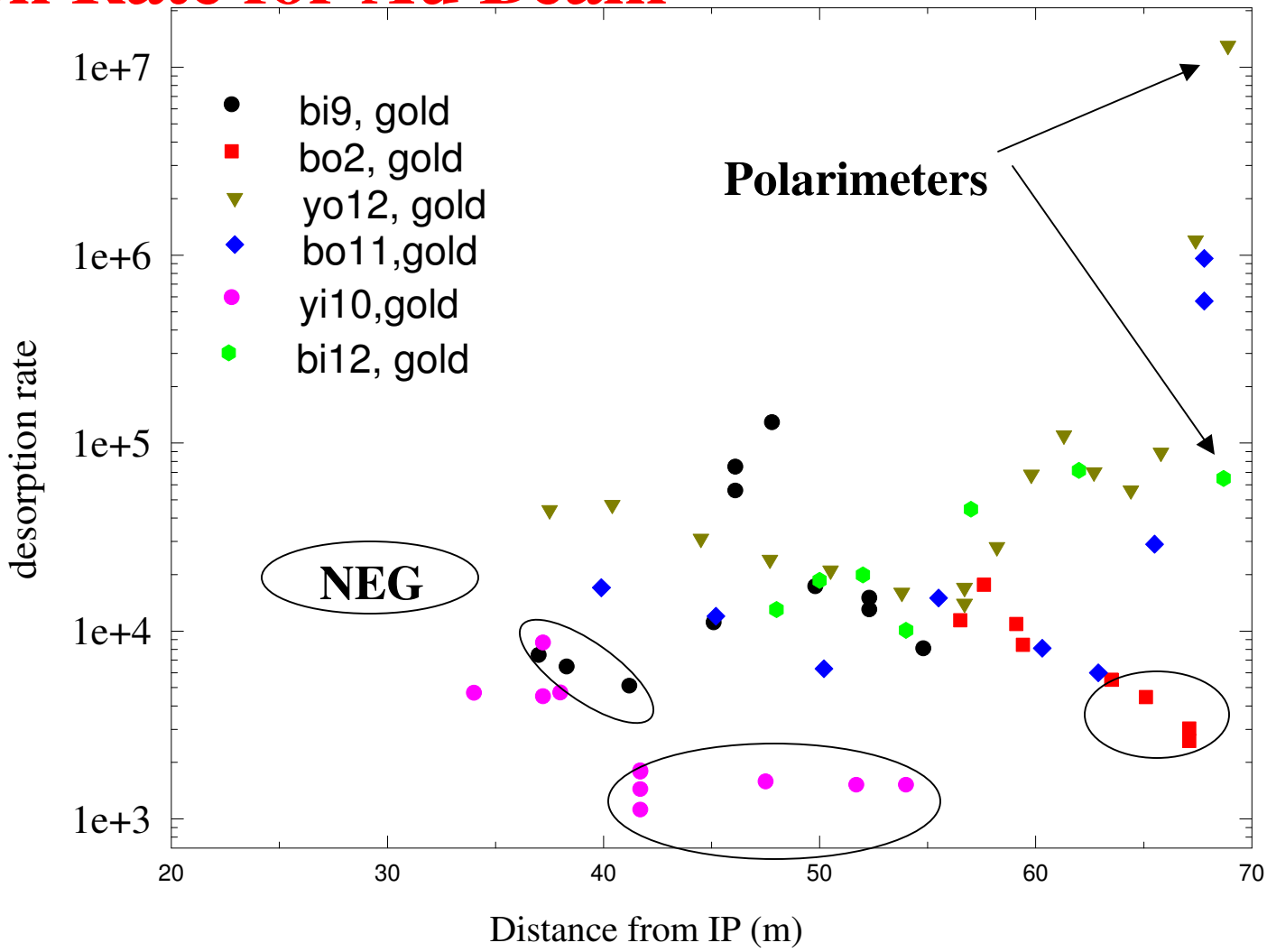
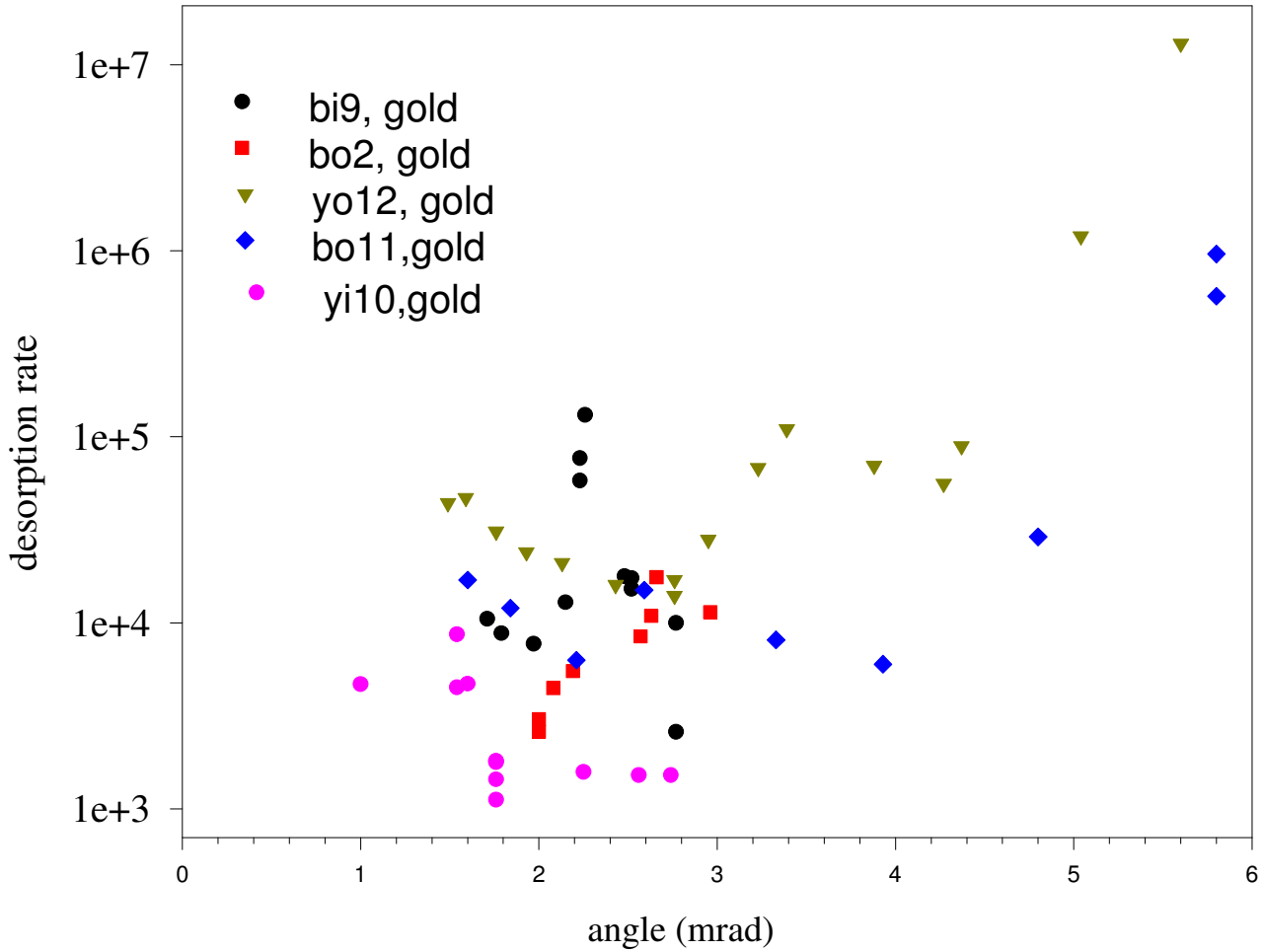
Desorption Rate for Au Beam



Except the NEG pipes and the ~70m ends of Bo11 and YO12 (polarimeters), the rest of area give desorption rate of ~10^4-10^5.

Bi9 the pattern is similar to Bo11 except the NEG pipe part near Q3. Due to the corrector position, we could not hit the pipe near to Q4.

Desorption Rate for Au Beam vs. Angles



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Single Turn Kick vs. Warm Dipole

bi12	distance	angle	intensity	dQ	h
bi12-tv2					
3:20:51			3.17	1.16489E-06	1.30E+04
3:22:34			3.07	1.61211E-06	1.86E+04
3:24:03			3.06	1.71857E-06	1.99E+04
3:31:54			2.57	7.3384E-07	1.01E+04
3:33:15			0.72	1.16512E-07	5.73E+03
3:33:59			2.66	9.52782E-07	1.27E+04
3:38:05	57	2.3	2.74	3.44126E-06	4.45E+04
3:39:27	62	1.9	2.73	5.5157E-06	7.15E+04
3:41:05	68.7	1.68	2.96	5.42008E-06	6.48E+04

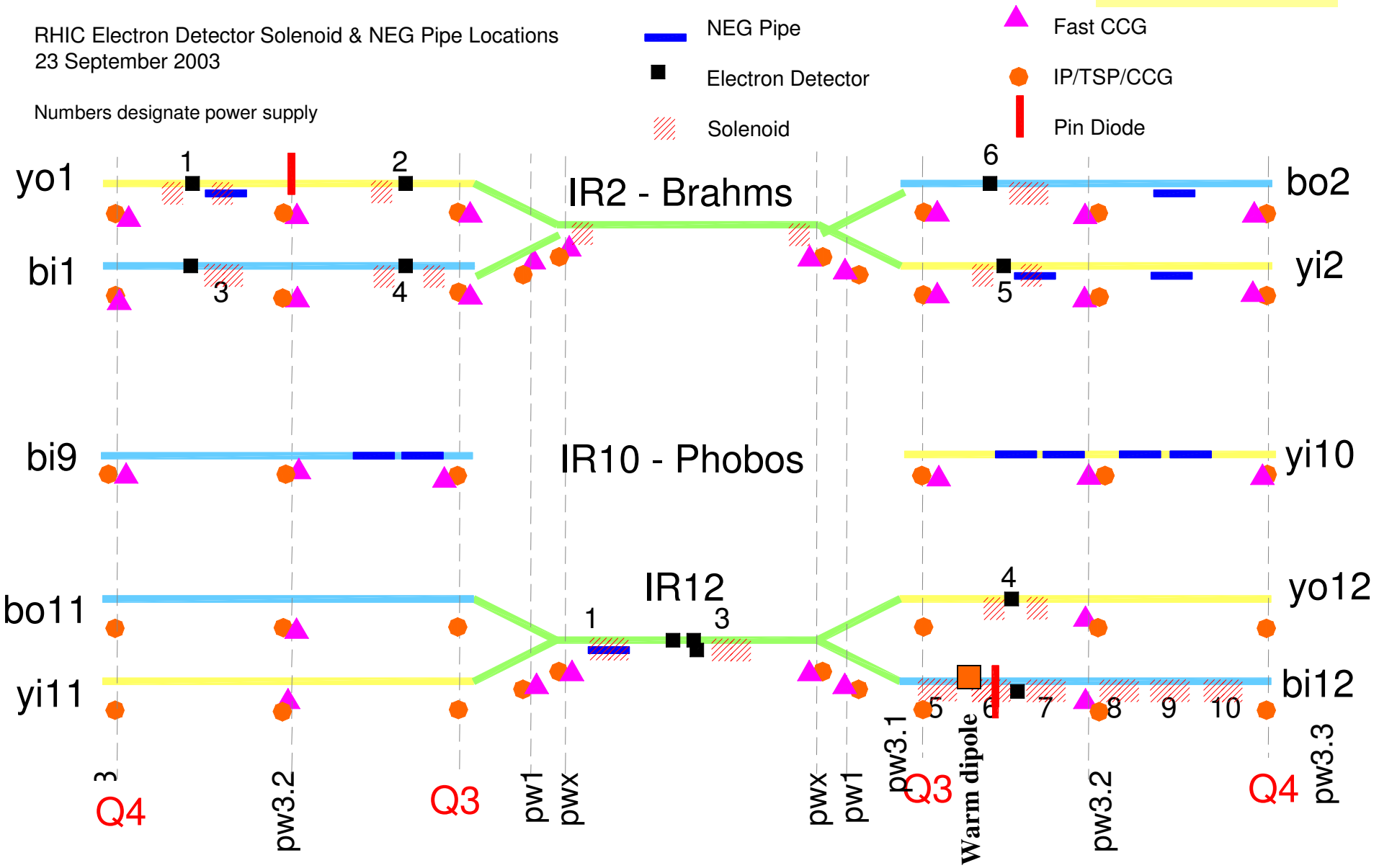
WMDIPOLE					
7:30:21			2.31	3.04637E-06	4.67E+04
7:32:42			1.35	1.09367E-06	2.87E+04
7:35:24			1	8.64205E-07	3.06E+04
7:37:16			2.16	1.97162E-06	3.23E+04

Warm dipole was between 50-53m. The two methods gave similar results.

Conclusion

- The typical desorption rates for angles range around 1-3 mrad are 10^4-5. At the extreme angles of 5-6 mrad, the values are in 10^6 range and even as high as 10^7 in YO12, where the polarimeter located (not baked, open for target installation every year). However, the desorption rate from BO11 is also quite high.
- The values measured with two different methods (single turn kick and warm dipoles) shows similar results.
- The desorption rate was in the order of 10^4 for regular pipe and the numbers for NEG pipe are 2~3 times smaller.
- The data from Au and protons have similar distance dependence, while the proton data is about 100 times smaller. We will take Cu data again for BO11 and YO12 and possibly other sections.

Loralie Smart



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